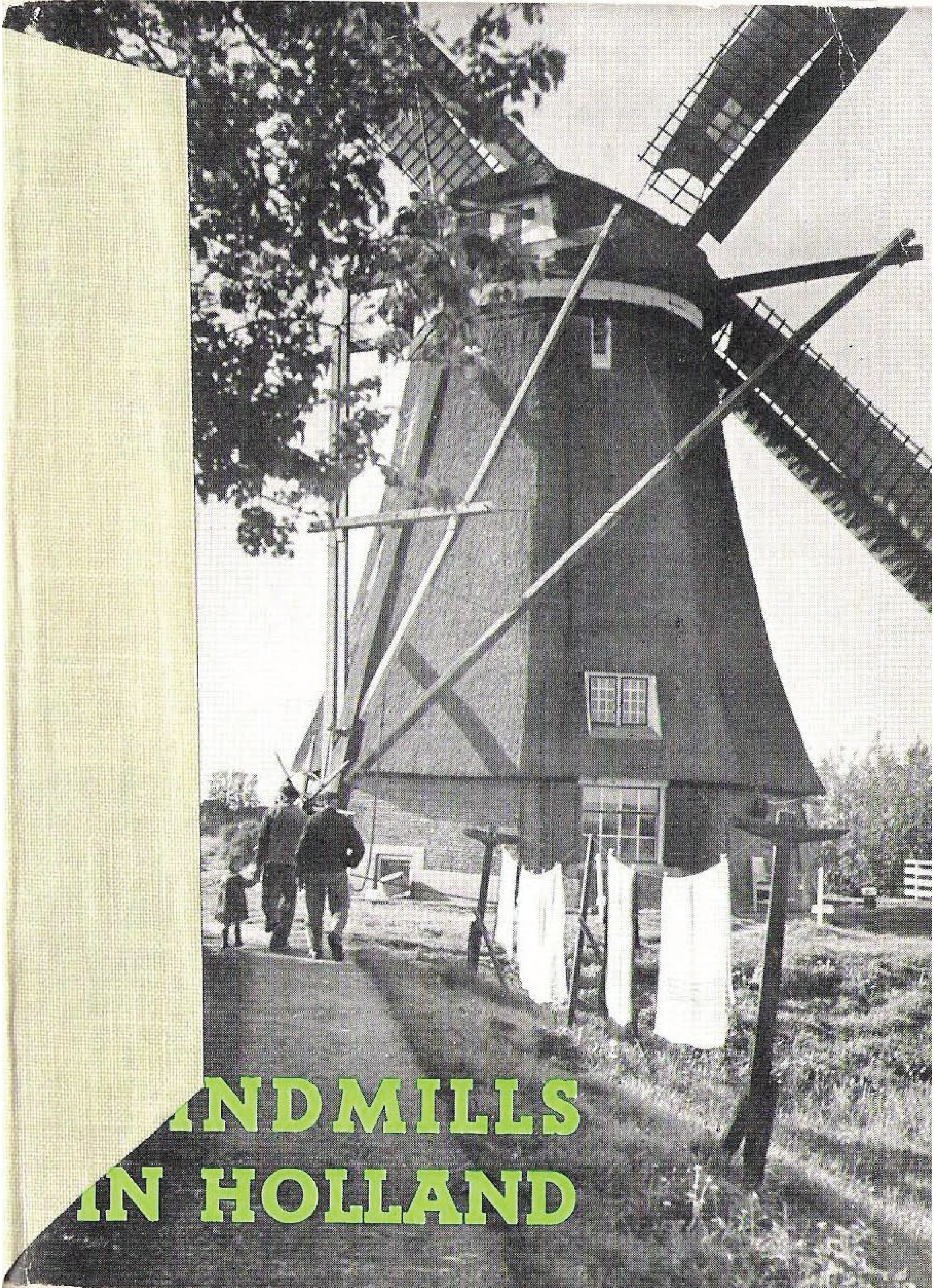


INDMILLS
IN HOLLAND

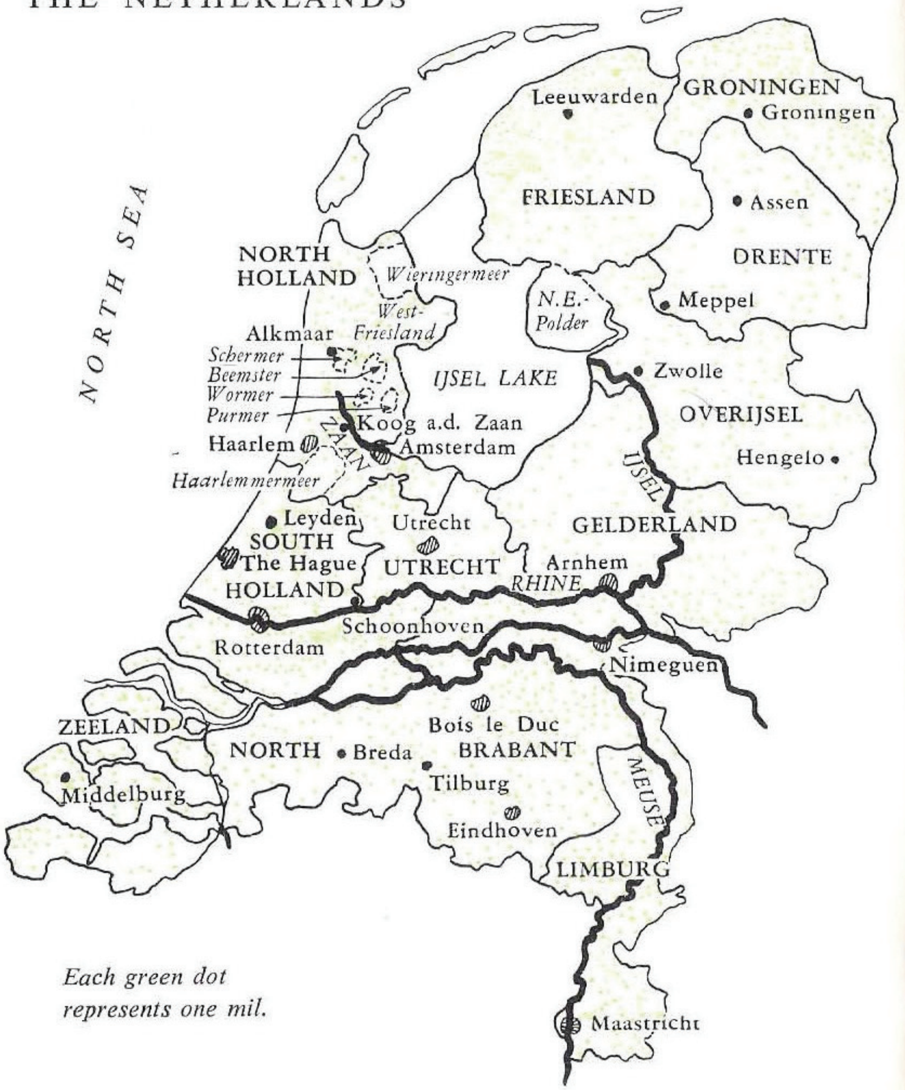
K. BOONENBURG

WINDMILLS IN HOLLAND

Drawings
by the author

NETHERLANDS GOVERNMENT INFORMATION OFFICE
THE HAGUE 1951

THE NETHERLANDS



Each green dot represents one mil.

Dr.

GENERAL

SHOULD it ever be possible to survey the whole of the Netherlands from the vantage point of a seat in an aircraft, one would discover that that ancient mechanism, the windmill, is not confined to the low-lying, watery regions in the west and north of the country, but that they occur just as well on the higher ground in the south and east. A diagonal line, drawn straight through Holland from south-west to north-east would form approximately the dividing line between the polder-mills, or "marsh mills" as they are called in England, and the corn windmills (south-east).

To admire the windmill in all its glory, one must forsake the highways and wander deep into the countryside, to the fertile pasture under the wide windswept sky. It is certainly worth while preparing the land beforehand, as it were, by looking up the size and locations of the still quite considerable groups of mills that are to be found even today. The polder-mills are not simply there to pump large and small lakes dry, and thus to create crop-bearing land, but they continue to do useful work long after, in keeping surplus rainwater from flooding the polder that they bring to life. Their task dictates that they be found in the deepest parts of the polder, very often below sea level.

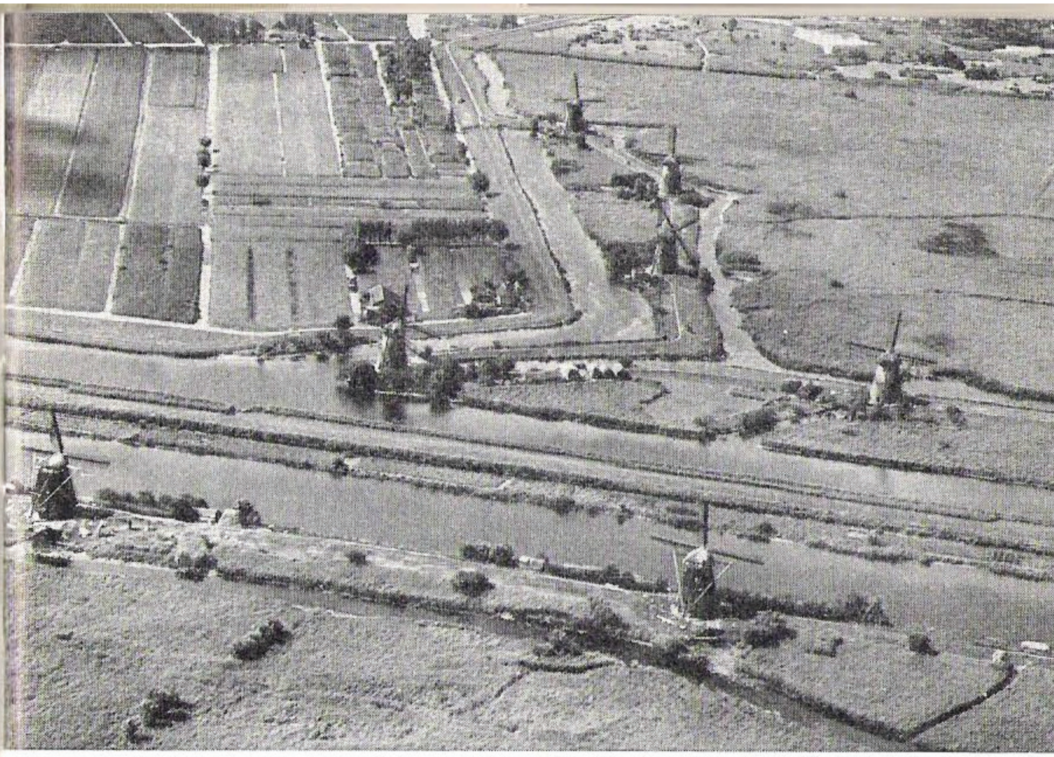
To the right of our imaginary diagonal line, the land possesses a natural drainage system, where surplus water finds its own way from higher levels to lower, collects into streams and rivers, and finally flows out to sea. Here, not a single polder-mill is to be found — only the industrially-employed mill, mostly housing a flour-milling establishment.

On the other side of the line, the polder-mill is supplemented by a certain number of corn and other industrial windmills, but these are much less numerous here than in the south and east. These latter districts are the home of the corn windmill, and in olden times each self-respecting village or small country town possessed one or more; as a matter of fact, many of them still do. These are sociable mills; they never stand alone and isolated as do their brothers in the wide polders. Around their skirts huddles a brood of dwellings and shops, and they stand out proud above them all, and above the surrounding trees. The grip of their mighty arms on the winds of heaven must not be hindered, from whatever direction the flighty breeze might choose to blow.

They are often to be found at the edge of the modern traffic road, and still manage to be "lords of all they survey" even today. There is very little chance of passing this type of mill unnoticed — their strangely human arms beckon attention to themselves from afar.

The general division of windmills into polder-mills and corn windmills holds more or less true today, except that one feels the term "industrial mills" more appropriate than "corn windmills", as there are still quite a few engaged in other industrial work than milling grist. In days gone by there were even more, and they included rice-husking, timber-sawing, and the expression of oil from various seeds. However, it is true in the main to say that the corn windmill now clearly predominates over the rest of the group.

To revert to the "opening theme", when one tracks down these hundred of mills from the air (photo page 5), which is a very amusing pastime for its own sake, and one observes how all their faces are turned to the direction from which the wind is blowing, one cannot help being struck by a sort of "sense of devotion" forming an element in the landscape, the existence of which in these low countries is unique in the world.



A group of mills seen from the air

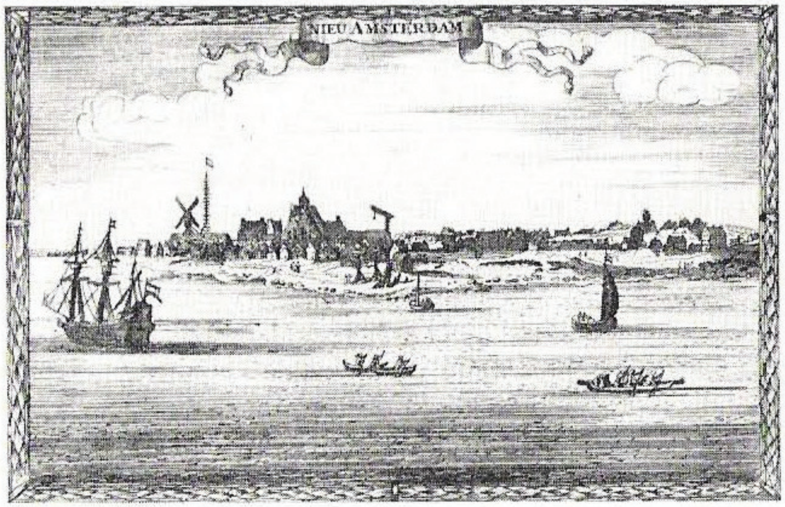
The concept of putting the wind to use, serving the ends and the daily means of mankind, is not specifically Netherlands. In all probability the seeker after the truth of the origin of the windmill could make a better start in Persia or Arabia.

But there is no doubt that the perfecting of this tool in the hands of man, both as pumping and milling machinery, has reached a stage here in the Netherlands generally acclaimed to be supreme. The various types have been copied in very many countries, often under the leadership of Dutch millwrights. It goes without saying, of course, that the use of this form of motive power as a polder pump is characteristically Netherlands.

History bears witness that the polder mill commenced its gigantic task more than five centuries ago. The type used then had been developed from the earliest known type of corn windmill — the post mill. This is the mill in which the entire body, carrying the sails with it, turned about a massive vertical timber post when it was desired to bring it into the "eye of the wind". This kind of corn windmill must therefore be older than the polder mill. As a matter of fact, the old Persian and Arabian mills were exclusively corn windmills, and in Holland, the post mill is known to have been used for grinding corn for 700 years.

The windmill has always been an important element of beauty in flat landscape. Seen from afar off, they look like tiny toy tools, investing the businesslike aspect of the vista with a hint of fun; from close by, a high wind helps to present an impression of great power, the massive machinery shuddering under the enormous forces relentlessly driving round each bulky timber wheel and shaft. It is precisely in this country, where the winds of heaven blow free over the open flatlands almost the whole year through, and where the power of the wind was vitally necessary to keep the land from becoming inundated, that the windmill has evolved into a tool of which it may be said that its principle cannot be bettered.

Of course, there have been improvements of a technical nature in the mechanism of the windmill of recent years, but they have all been a matter of detail. The windmill has achieved such fame that it has become a national symbol — and not an unsuitable one! Large areas of the country have been wrested from the sea by its aid, and a good many branches of industry began as some form of milling. Moreover, Dutchmen have emigrated to almost all parts of the world in past centuries, and where the climate and configuration were suitable, they got down to building themselves windmills straight away. The oldest known maps of New York, then New Amsterdam, (photo page 7), do indeed show a timber windmill. However, in most of these former colonial possessions, the windmills were neglected, fell into disrepair, and were cleared away. They have survived only in the motherland — the trusty sentinels of a byegone age — but in quite large numbers. The recent world war wrought savage slaughter among them, 52 being lightly damaged and 171 heavily damaged or completely destroyed during the last few months of hostilities. Most of the damage was in the Provinces of North Brabant, Limburg and Gelderland, and in all, some 11 percent of the total became casualties. Most of them succumbed to shelling, either by artillery, tanks or aircraft. A lot more were blown up, burnt or pulled down by the Germans, just before their enforced exodus from the country, hotly pursued by the allied armies.

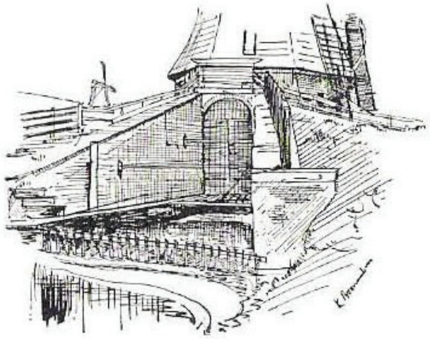


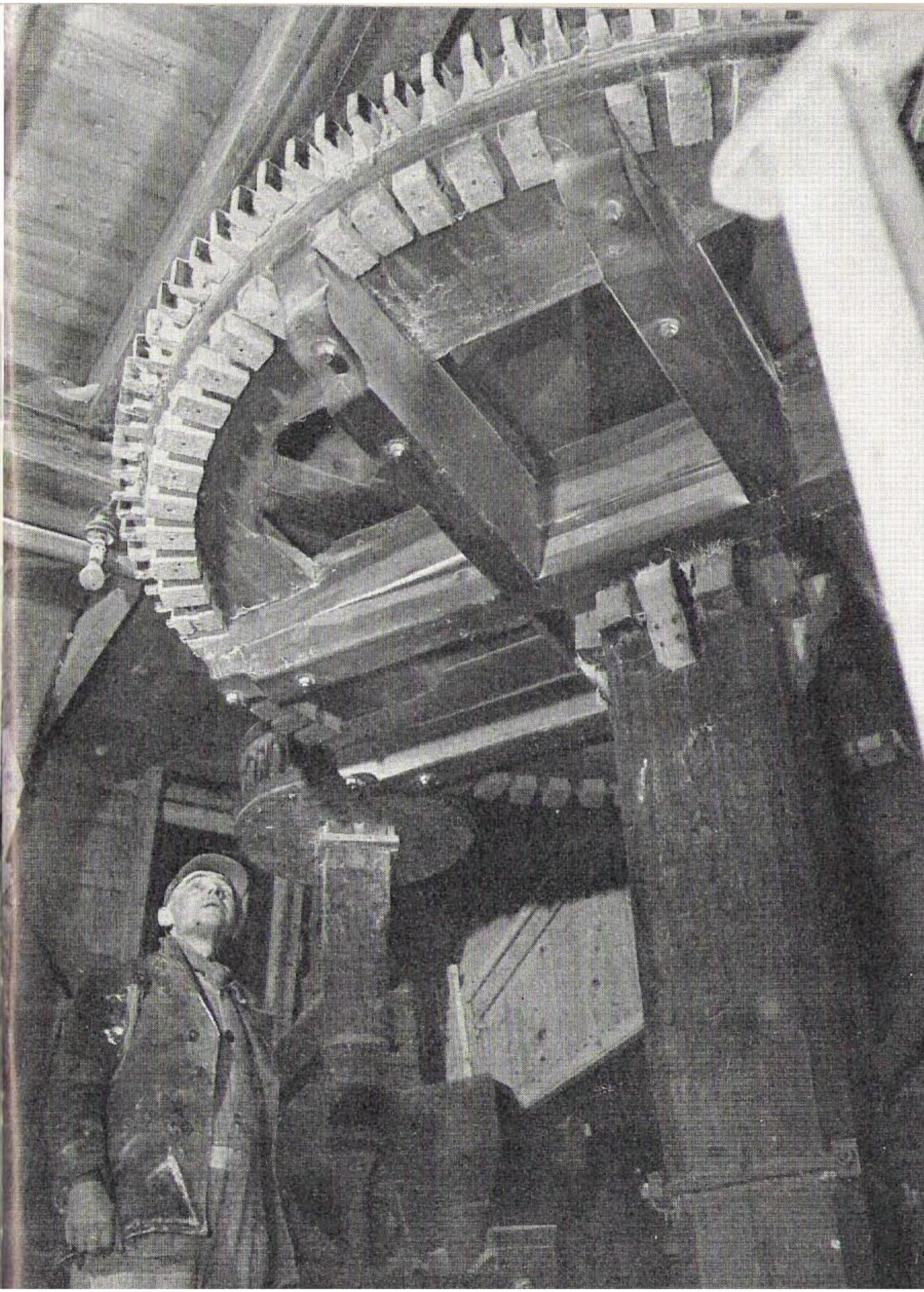
New York — three centuries ago

To turn to the brighter side, nearly all the damaged mills have been put back into repair now, and a few of the completely destroyed mills have even been entirely rebuilt. The country's "windmill population" is at the moment about 700 polder mills and 1050 industrial mills, mostly corn windmills. Out of this total of 1750, some 1300 are still intact and in use.

We often see on the silver screen, portrayals of windmills which could not survive a second's scrutiny by even a slightly knowledgeable person. The sails — electrically driven of course — turn with the mathematical precision of a jewelled chronometer. But the winds falling upon the sails of the real windmill, gust them around with the joyous abandon of nature. And every now and then, the wind hesitates and the sails with them — we could hardly expect the film set constructors to realise this.

The aesthetic element of the windmill is a matter of coincidence. It so happened that the most purposeful form of body, cop, or sail, turned out to be the most beautiful. Many and legion are the artists inspired by the windmill, in they include the great old master—Rembrandt himself.



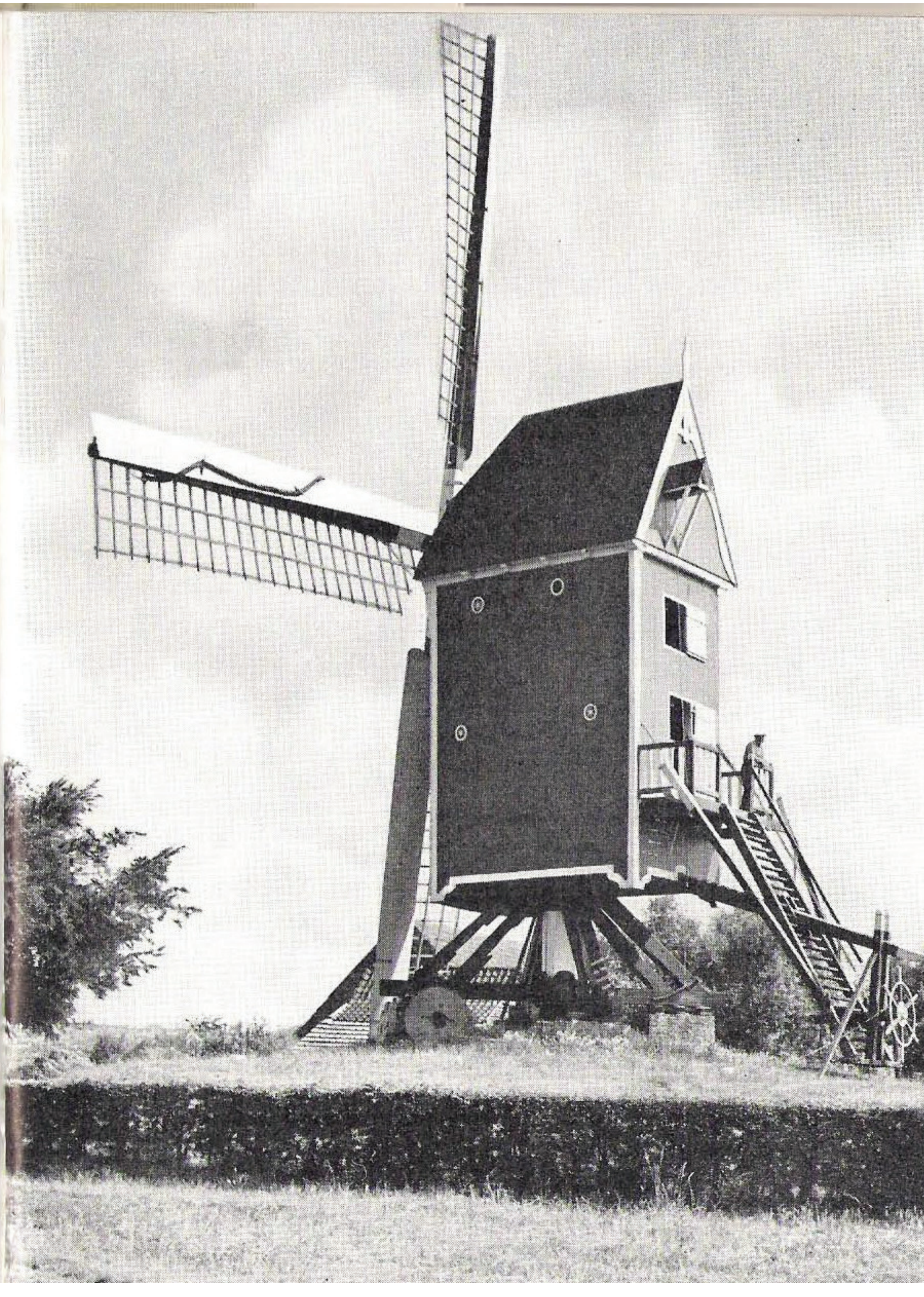


The strange intriguing world inside a mill

THE EARLIEST WINDMILLS

THE necessity for grinding corn has been one of mankind's primary cares since the dawn of civilization. There are undeveloped peoples here and there in the world, who are still unaware of the process we call milling or grinding; they either pound their grain with wooden stampers, or use stone pestles and mortars. The Bible repeatedly mentions "hand mills" operated by women or slaves. The Romans used heavy marble rollers, running on flat stone slabs. Certain forms of "slave-power" mills have been known, which comprised flat stones in which grooves or "furrows" were engraved. These must have been the early forerunners of the present-day carefully fashioned mill-stone. A slightly higher stage of development was represented by the horse-mill, usually worked by one or two horses.

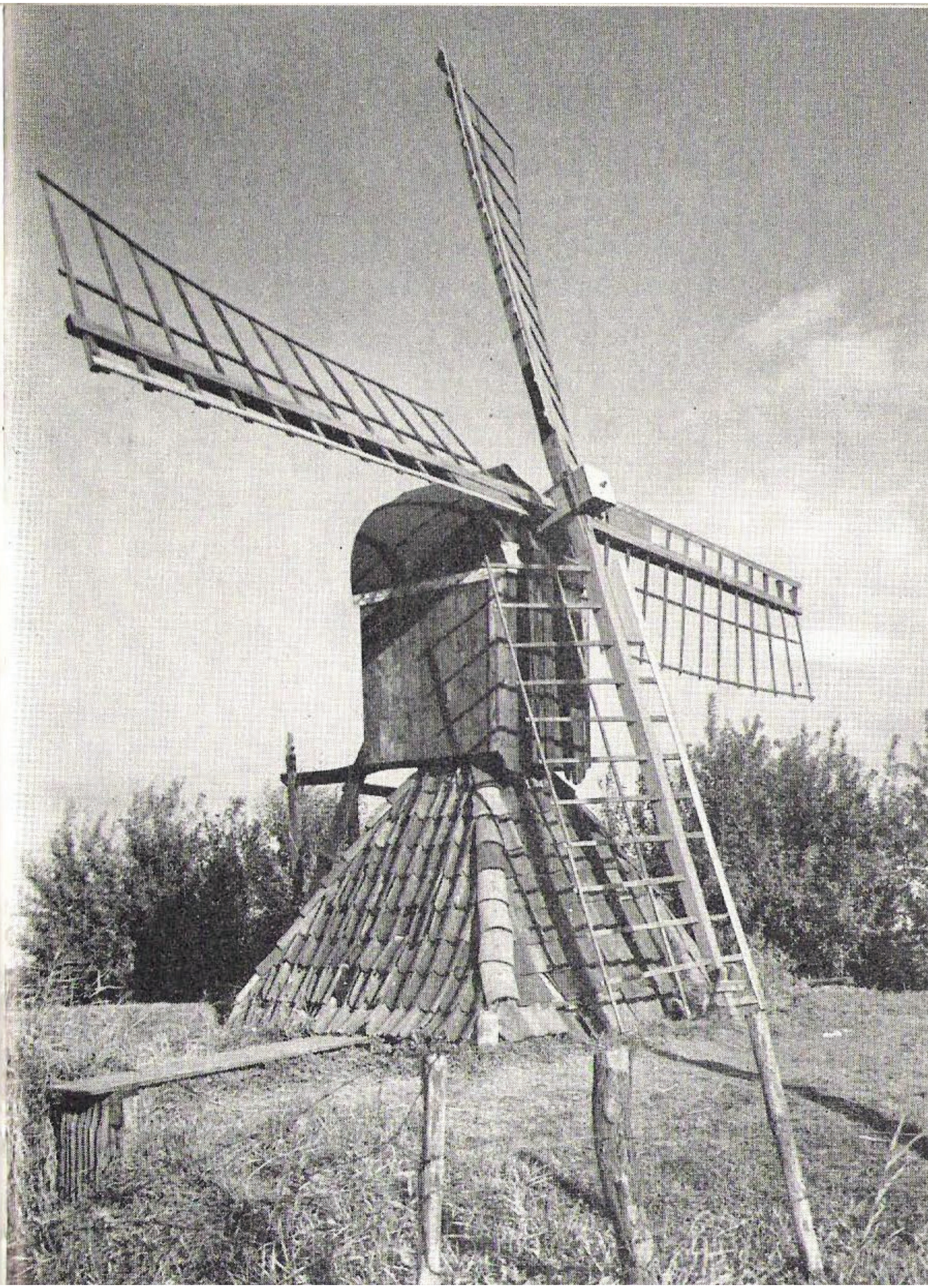
We know that Mithridates the Great, King of Pontus, possessed a water mill in the year 132 B.C. Moreover, the Romans had them in addition to the types just mentioned — the "mola aquaria" is described by Strabo and Vitruvius — but we've no reason to believe that they had the windmill. It is now considered a certainty that the windmill has evolved from the water mill — the reader will know it, the type of mill driven by the fall or the rapid flow of streams of water, and found in rolling or configurated country from very early days. They are also to be found in the eastern and southern provinces of The Netherlands. Even to the present day, the internal wooden machinery of the scoop-wheel water mill exhibits points of surprising likeness to that of the windmill. Perhaps the earlier occurrence of the water mill may be accounted for by the somewhat simpler technical principle involved, as compared with the windmill. The earliest European timber mills, dating from about the year 1250 A.D., are a much more satisfactory piece of engineering than Eastern stone-built tower mills. They were



A neat example of the post-mill . . ..

post mills, (photo page 11), constructed entirely in oak. They served to grind grist, which had been carried out up till then in portable hand mills. The name "post mill" is clearly derived from the post — or heavy upright timber axle-shaft — around which the entire mill body pivots. The body contained the mill-stones, driven round by the sails. High in the mill body is set the "windshaft", which has an enlarged head-block at the end which is intended to face the wind. Through this poll-end are morticed two "stocks", at right-angles to each other, which carry the sail-framework to which the sail-cloths are affixed in one way or another. Framework and cloth together form four sails in the familiar pattern of a cross, each of which is slightly inclined to the common plane, so that the wind, blowing in line with the windshaft, provides a "sideways" force component — and the sails turn, carrying the windshaft round with them. On the windshaft, inside the mill body, is a large timber wheel, which the Dutch call a "crown wheel", but which in English windmill terminology is called a "brake wheel" by reason of the practice of using it to put the brake on the turning motion of the sails. A series of timber gears transmits power from the "crown wheel" to a number of vertical shafts, which each drive the uppermost of a pair of grooved mill stones. The grain to be ground is fed between the two stones, one still and one turning, and the resulting flour finds its way to the centre of the stones along the grooves, and falls into the waiting flour sacks.

All this happens in the mill body, which as mentioned earlier, turns as a whole around the "post". At the back of the mill, that is to say on the side away from the sails, there is a flight of steps for access. The steps therefore turn with the mill when the latter is "winded" or turned into the "wind's eye", as does the "tail-pole", a heavy beam by which the actual turning is carried out. These then are the main principles — in extremely shortened form — of the construction of Holland's oldest windmills, and there are still a few examples of them in existence today.



... its little nephew, the 'spider' ....

THE POLDER
OR DRAINAGE MILL

ROUND about a thousand years ago, the entire western and northern parts of the Low Countries were one large lake and marsh district. Behind the seaward ridge of sand-dunes — which, by the way, were by no means so broad and solid as they are now, and in places were even interrupted completely — lay a wide area of land partly subject to periodical inundation by the sea, and partly the prey of every abnormally high level in the great rivers Rhine and Meuse. In the stagnant pools and lakes, there developed vegetation which gradually formed the material for peat marshes, of which the low-lying polderland today largely consists. On the few elevated sites, a certain number of villages and small towns had grown up, and here and there a monastery. Small wonder that the Dutchmen of those days had to be constantly on the qui vive for the threat of floods. Rivers were gradually reinforced along their banks with dykes at the danger points. But their primitive efforts to keep out the mighty sea were not always attended by success. The puny sea-dykes were repeatedly washed away and a pitiful death by drowning was the reward of many of the constructors and their families. Dire necessity drove them on to still further efforts, and they eventually succeeded in putting up a workable system of flood retaining dykes — a final "line of no retreat" against the advancing waters. The land behind these dykes had to be kept free of surplus rain water, of course. It was naturally extremely low-lying, and its soil was composed of alluvial deposits and marshy peat. The process of drying-out lowered the level still further, and the problem of drainage began to loom large. Thus far, there is no question of reclamation from sea or lake —

. . . . and its cousin of the polders, 'the wipmolen'

simply of keeping hastily dyked-in tracts of soil dry. Since time beyond recall, this function had been performed by means of scoop-wheel mechanisms, powered by hand or by horse. It was very probably round about 1350 A.D., that some genius of a byegone age first hit upon the idea of converting one of the existing post windmills to the drainage of low-lying land, and it is this flash of technical foresight which has been mainly responsible for deciding the aspect of these stretches of land right up to this year of grace 1950, and looks like continuing to do so for some time yet.

In the course of evolving later mills specially suited to drainage work, far-reaching changes in design were made, resulting in a completely new type known as the *wipmolen* which is untranslatable, but looks rather like what is called a "composite mill" in England, (photo page 15). The earliest known example was erected near Schoonhoven in 1430.

The large and high body of the post mill, often containing two floors, was replaced by a smaller structure, just enough to contain the transmission. The pyramidical "round-house" under the mill body, on the other hand, expanded into the actual working space. It no longer contained mill stones, of course, but in their place came a vertical scoop-wheel of some considerable diameter, capable of elevating water through a height of about three feet.

The round-house is fixed, and the scoop-wheel, often built outside the mill structure, turns therefore in a constant fixed plane. But the mill still had to be "winded", and the now much shrunken body — referred to as the "cap" — was equipped to turn just as the post mill body had done, though the transmission became changed in the process.

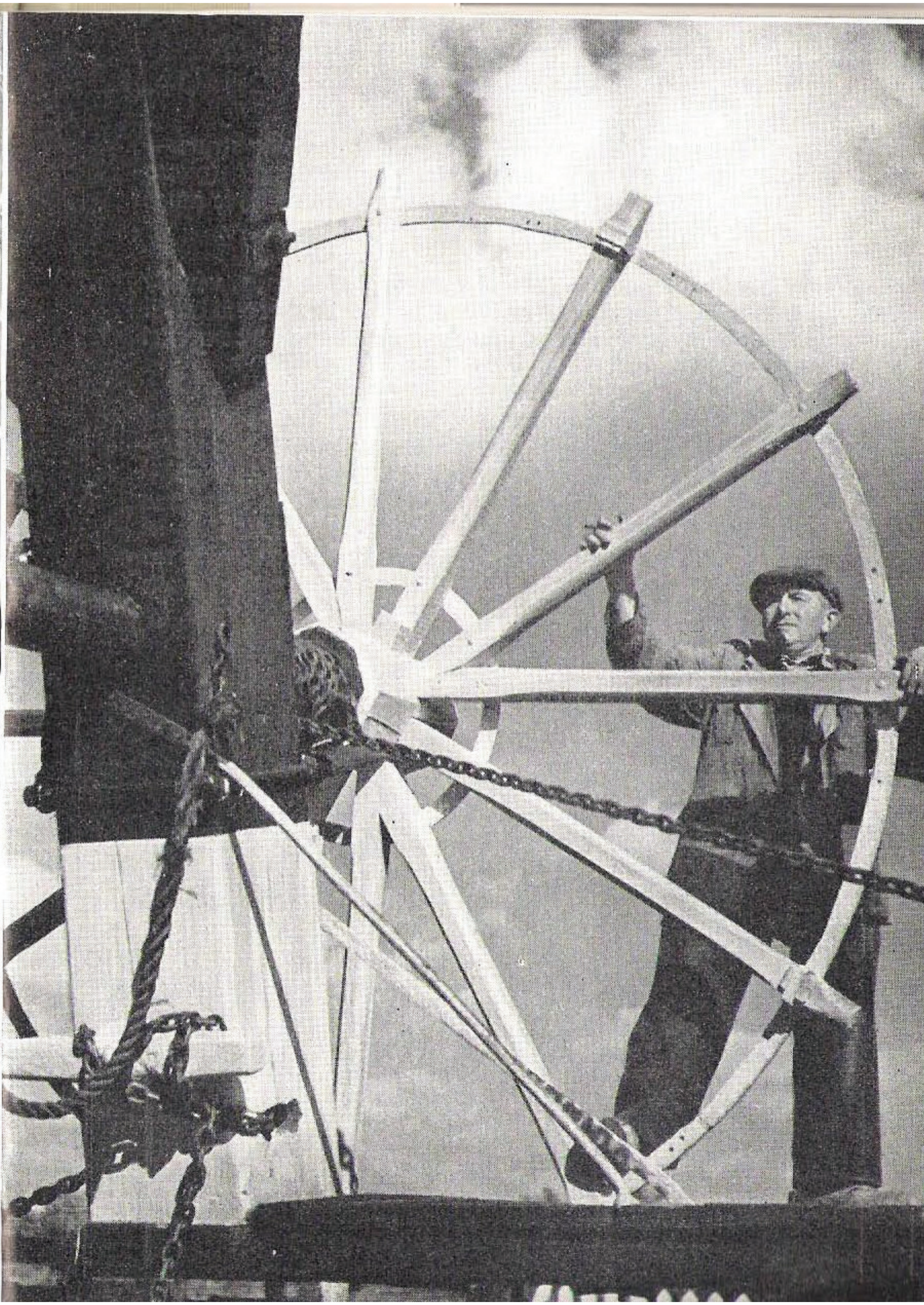
The means resorted to, consisted of replacing the "post" with a heavy hollow sleeve, around which the cap could be

The polder-mill by the dyke

made to turn, and which was capable of accepting a vertical mainshaft through the boring. The upper end of the mainshaft was driven from the windshaft by timber gears, and a similar transmission coupled the lower end to the scoopwheel. In this form, the *wipmolen* was known as a *kokermolen*, or "sleeve mill".

The provinces of Friesland and South Holland in particular, evolved a somewhat smaller version of the *wipmolen*, which is known as a *spinnekop*, or *spinbol* — literally a "spider", in which nomenclature there is perhaps an element of humour (photo page 13). The large *wipmolen*, (photo page 15) found almost exclusively in the province of South Holland, is sometimes occupied as dwelling accommodation, and sometimes not. The occupied mill is of very interesting construction; the division of this pyramidical space into rooms possessed of a high degree of ease of occupancy, is a problem that would tax the ingenuity of many a present-day architect, but our forefathers have made a wonderfully efficient job of it. The scoop wheel is not always built into the mill itself, nor even always enclosed. It often stands quite separately at a short distance from the mill itself.

It was only a small stage from here, before the need began to be felt for drainage mills of heavier construction and greater power, particularly in connection with the early ambitious projects for pumping lakes dry in the interests of land reclamation. The resulting mill is octagonal in plan, and is known as the *grondmolen* or *weidemolen*, the latter being translated as "meadow mill", but its features entitle it to be referred to as the tower mill (photo page 17). The body is of heavy timbers, faced in with reeds or bricks, and surmounted by a relatively small cap, which is the only feature capable of being turned or "winded". When faced in with reeds or some such material, it is very similar to what is called a "smock mill" in England. The cap carries the sails,

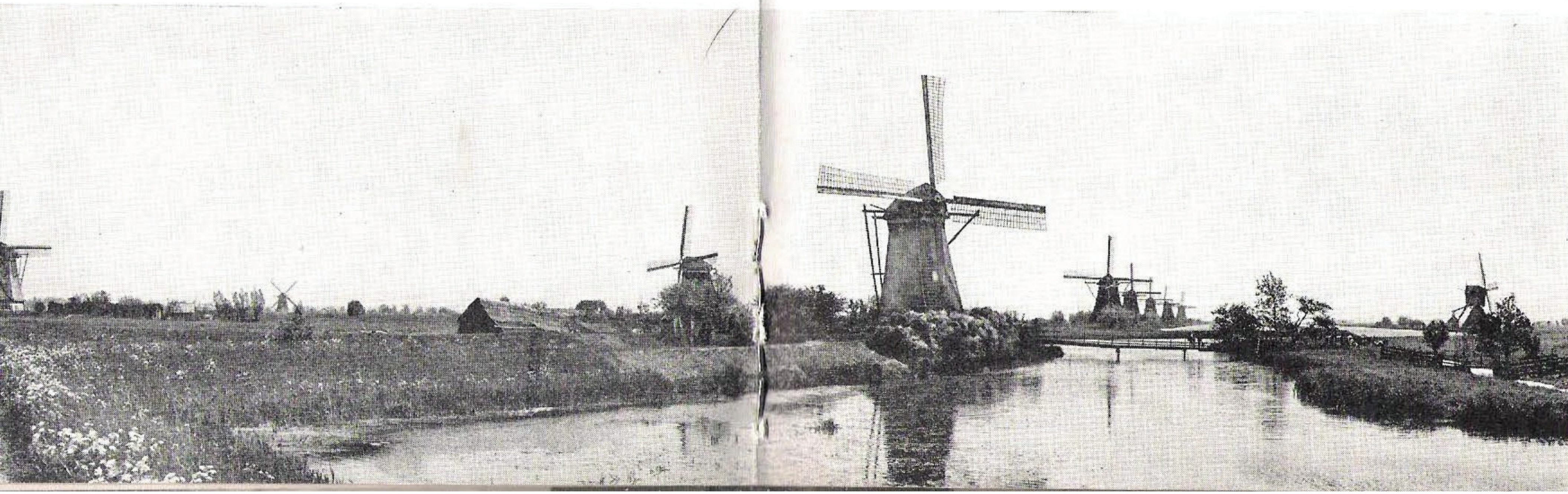


Turning the mill 'into the eye of the wind' and opposite them, the tail pole with its bracing struts — and "winding wheel" — used to wind the mill, (photo page 19). Examples have been constructed in a wide range of sizes.

Variations from the general octagonal plan exist, usually hexagonal, twelvesided or round, both in timber and brick. All these types are faced into the "wind's eye" by external apparatus.

However, there evolved a specific type in the province of North Holland, called a *binnenkruier*, which we might translate as "inside winder", (photo page 23). This is a particularly massive octagonal timber mill, faced in reeds and rather less decorated than the South Holland mill. As its name suggests, the "winding" gear is contained inside the mill, and for this purpose the dimensions of the mill cap exceed those of any other type. It would be generally true to say of all these polder mills that the larger of them are occupied as homes for the miller and his family, and the smaller unoccupied.

During the course of the seventeenth century, a second principle joined the scoop wheel as a means of elevating water, and was soon coupled to the windmill. It consisted of a primitive form of the worm or screw pump, and it possessed the advantage of a much increased height of elevation per stage — from 5 ft. for the scoop wheel to 16 ft. for the worm pump. Moreover, it was hindered by much less starting inertia. But despite this, the curious thing is that the scoop wheel seems to have maintained its position right up to the present day in a good many mills.



windmill's share in the beauty of the Dutch scene

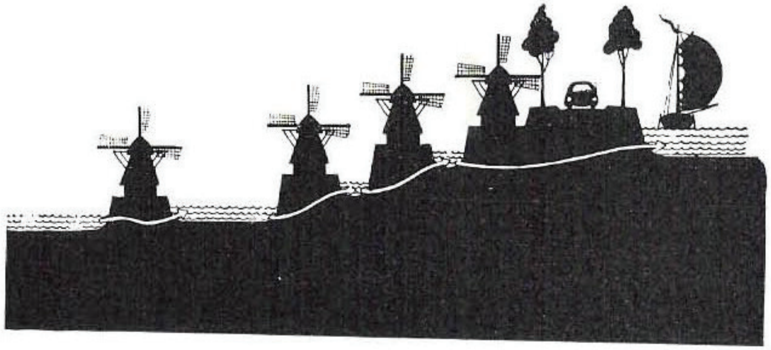
LAND RECLAMATION

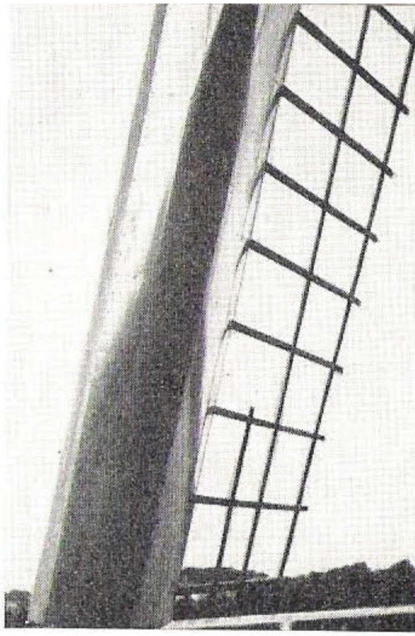
Up till the sixteenth century, Holland boasted a great number of large and small lakes, connected by broad channels, which have been made to disappear during the succeeding centuries, to yield rich farming land. The Schermer Beemster, Purmer, Wormer, and Haarlemmer Lakes — to mention a few — now no longer exist as expanses of water, and large tracts of new land around the former Zuider Zee bear oft-quoted witness to the Dutchman's industry and ingenuity in wresting increments of land for his mother-country from the wild — or perhaps in this case, sad — sea-waves. Producing dry land from the Schermer Lake, for instance, was a vast and technically very difficult undertaking for the seventeenth century, and its successful achievement was due to the skill of the engineer and the mill wright, coupled with the spur received from the avid search for investment opportunities by the rich merchant of the day. The ancient town of Alkmaar received permission in 1631, from the provincial authorities of Holland and West Friesland, to dyke in the Schermer Lake and pump it dry. The plans were those of the posthumously renowned civil engineer Leeghwater, whose name — strangely enough — being translated, means "low water". After five years of mixed fortunes, the water was eventually mastered and a commencement was made with the parcelling out of the land.

The total area within the encircling dyke was 11,720 acres, and the entire polder was divided into 14 sections, each of 815 acres and each possessing its own polder mill. All 14 windmills fed water into a common internal collection basin — actually a network of canals — where it was stored temporarily. At three points on the eastern sector of the

Two of the 'inside-winders' of North Holland ring dyke it was pumped further up to an outer collection basin — of which the ring dyke itself formed a part — by no less than 36 windmills driving worm pumps. This latter "company" of mills — for want of a better word than flock, clutch, pride or herd — were arranged to pump in series, about which I shall have something more to say later.

When it was a question of "drying out" a deep lake, the windmill descended by stages, as it were, to the deepest point of the new polder. The commencing operation was the construction of a periphery canal around the area to be pumped dry, and reinforcing it with very solid dykes. A number of mills then made their appearance at various points around the canal and commenced to pump the lake into it, whence the water was carried away to sea. They continued to pump until a certain lowering of the lake level had been reached, at which the channels from lake to mill themselves became dry. Each mill then received what one might call a "pacemaker", in the form of a windmill at a lower level on the newly dried-out land, which kept the supply channel for the first mill full. This sort of thing sometimes went on "unto the third and fourth windmills", like this.



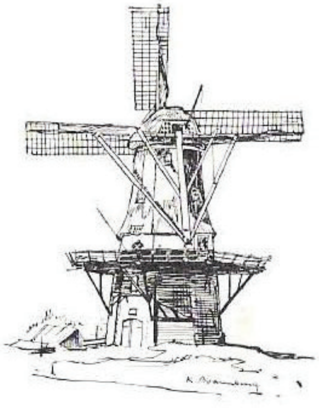


It stands to reason that the precise situation of all these mills and their channels was all calculated out and planned before the commencement of operations. A really extensive reclamation job would contain complexes of upwards of forty, fifty or sixty mills, forming together an indescribably beautiful scene.

Polders cannot always be sited so as to be pumped out into reservoirs connected with large rivers or the sea. It is often necessary for a number of polders to be combined together to form a common reservoir. The whole thing then stands under the control of a body known as a *waterschap*, *heemraadschap* or *hoogheemraadschap*, which we might call various forms of "waterboard" though the water they control is gathered together for other reasons. These boards formulate their own standard and regulations, which are very strictly enforced.

The lower lying parts of the Netherlands, have always been tracts of country in which water has been feared but found necessary. Too much water spelt disaster — but too little was just as bad, for irrigation and waterborne traffic were brought to a standstill by it. The Portuguese author R. Ortigao, who visited Holland about 1880, recorded his impressions in this form (freely translated):

"And so, from ditch to ditch, from canal to canal, from dyke to dyke, from mill to mill, all the surplus water is gradually passed upward from the one to the other, ever higher and higher, until it finally reaches the last canal of all, the one above sea-level. And when there's still too much water there, when positively no-one wants any more of it, neither to carry his barge to his door, to give to his cows or his tulips to drink, to water his flower beds, to give his ducks a swim, to spray the fruit-trees in his orchards, nor in the heat of the summer evening to provide a thin dancing stream for the miniature waterfall of an ornamental cafe garden . . . . . when absolutely no single Dutchman anywhere at all in Holland needs a single drop more water for anything imaginable — then the last of the long, long series of mills opens the sluice entrusted to it, and releases the remaining water into the wide ocean, just as simply as the visitor to the spa, seated by the well, who — having slaked his thirst — flicks the last drops of water out of his glass, over his shoulder".



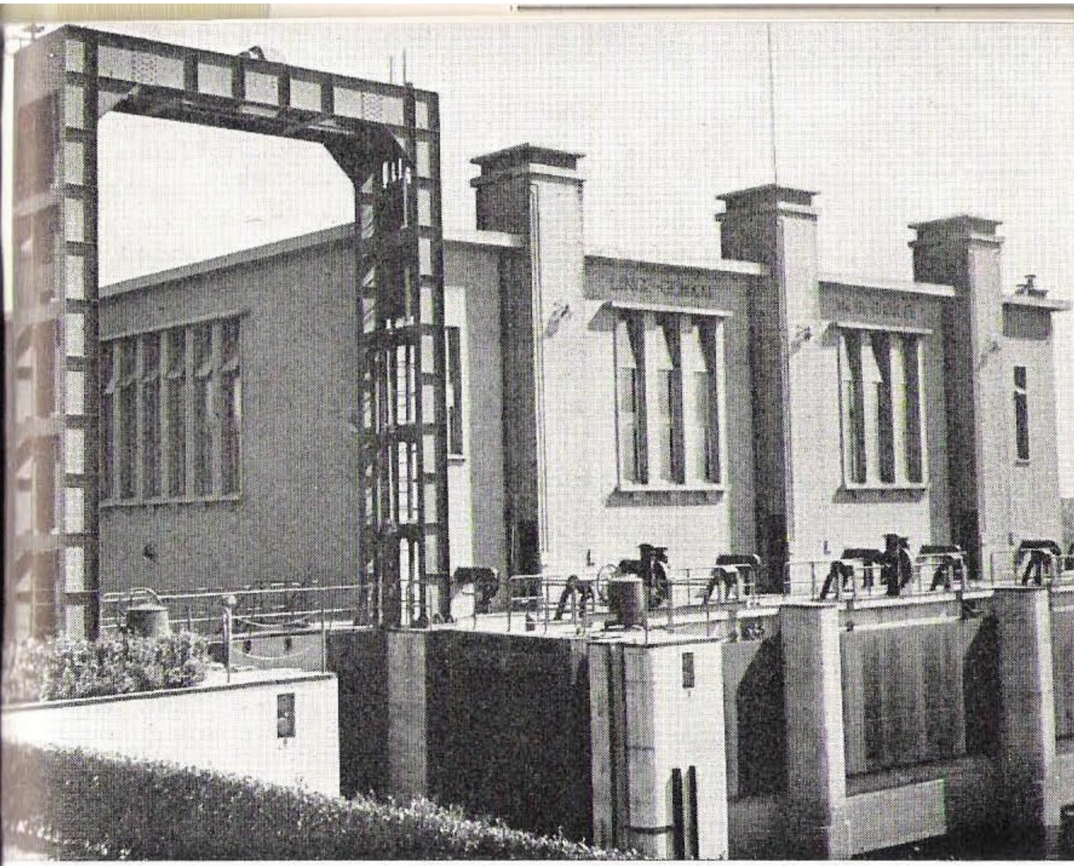
A row of South Holland brick Polder mills

THESE PRESENT TIMES

In recent times, quite a number of windmills have been subjected to technical and scientific examination in Holland, and it has been found that in general form, construction, and dimensional relationships, they were really excellent.

The backward inclination of the sails by something of the order of the traditional 10°, has turned out to be very suitable indeed as regards the acceptance of the force of the wind. It seems that the wind usually falls in gusts slightly towards the earth, which therefore strike the sails more or less at right-angles. The sheer and other weathered lines of the sails approach the perfect lines of the well cut suit of sails of the Bermuda-rigged ship.

This has, of course, not eliminated all possibility of effecting improvements, and in fact, a good many have been carried out of recent years, on minor points. For instance, the mill can be met with, where the sails have sheet steel attachments to the leading edges, whereby the aerodynamic form is improved, (photo page 27). They reduce the wind-resistance of the sails and allow the windmill to reach operating speed in a much shorter time. Another novelty is the addition of a small wooden sail just behind the first, the whole exhibiting an aerodynamic analogy to the jib and mainsail of a sailing boat. Finally there have been changes in the internal mechanism of the windmill — which are really normal evolution — such as the application of roller bearings, the replacement of the scoopwheel by pumps, and so forth. Minor though they are, these improvements have been of great value in modern competition with other sources of power. Even during the last century, the steam pump had made considerable inroads upon the terrain controlled



A modern diesel pumping station — the successor to countless windmills.

up till then by the drainage windmill, offering the advantage of independence from the vagaries of the winds. Nowadays one sees increasing numbers of motor-powered and electric pumping stations, (photo above).

Nevertheless, the country's hydraulic situation remains in general precisely as it was constituted years ago by the possibilities inherent in the windmill.

The reader may well ask if it would have been possible to bring to fruition such a gigantic project as the reclamation of the Zuider Zee, if no other equipment were available than windmills. It is, of course, very difficult indeed to give the answer with certainty now, but it is probable that, when taken in more stages and with smaller polders, even that tremendous work would have succeeded. One thing that can be asserted with all confidence is that this, the summit of all water engineering work, is a direct descendent of the age old windmill tradition.

Arising from the compulsion felt by many, of continuing the useful life of the windmill, and of obtaining from it more useful work than is the case at present, equipment has now been constructed to enable the windmill to generate and store electricity during the idle hours. When the wind dies to a calm, the same plant can operate as a motive unit on the stored-up electricity, permitting the work of the mill to continue with the sails inoperative. This is a development from which much is expected in the future.

A ratchet-feed timber sawmill near Zaandam

THE INDUSTRIAL MILL

As long ago as the sixteenth century, attempts were being made to adapt the original corn-grinding post mill to other industrial purposes. They were crowned with a good deal of success, and the mills evolved constituted the world's earliest sizable industrial complex. Present-day people will be surprised and perhaps amused to hear that they met with bitter resistance from the old trade guilds, who strove to maintain the pre-eminence of the handicrafts, and saw in these wooden monsters nothing less than the originators of unemployment.

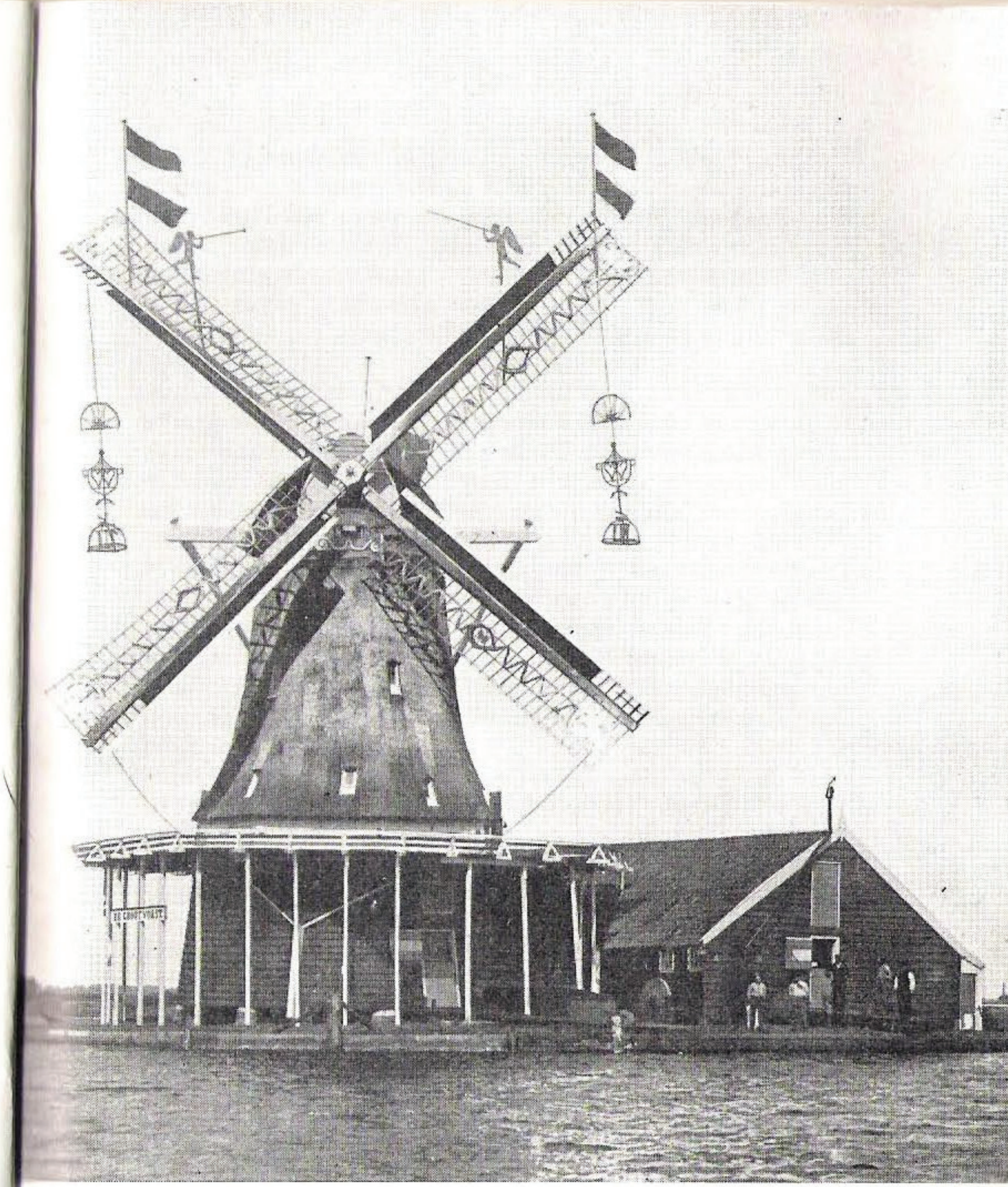
With the Treaty of Utrecht in 1581, there commenced an increasing demand for commodities. The concurrent rise of world shipping was bringing new merchandise into the country, much of which needed further processing.

In the towns there was an almost crippling shortage of space, and building outside the walls was only permitted in exceptional cases. All in all, the crying need was for a new settlement where' greater freedom of action was possible! It was found — along the River Zaan in North Holland, in low-lying flat countryside, criss-crossed with waterways ensuring the rapid transport of raw materials and finished products. Here, in the Zaan District, was evolved many a new type of industrial windmill during the ensuing years. By the end of the seventeenth century there were no less than nine hundred windmills (including drainage mills) in a very small area, and there has never existed such a concentration as this anywhere else. The reader abroad who has seen in his childhood picture-books, highly coloured stylised representations of "little Dutch boys and girls" with numerous "little Dutch mills", has had in his, or her,

One of Holland's tallest corn mills, at Schiedam hands nothing else than a somewhat idyllic memory of the legendary "windmill land" that was the Zaan valley in those earlier days. Right up till the end of the last century, the Zaan was still functioning as the almost inexhaustible reserve from which a windmill could be obtained if one was needed elsewhere! No less a personage than Czar Peter the Great of Russia came here in his younger days to study the timber sawmill and shipbuilding. He worked there as an ordinary tradesman, and achieved something of a reputation as a carpenter and joiner. The industrial plant and installations that are now to be found along the Zaan are simply the modern progeny of those old industrial windmills in which Czar Peter would have learnt his trade. In the Zaan District, the following types were evolved from the basic windmill — the sawmill, oil mill, husking mill, paper mill, spice mill, and many others.

The first of the sawmills was built in 1592, and stood on a heavy timber raft floating freely in the waters of the river, allowing it to be 'winded' by towing the raft round to face the desired direction. Further experiment along these lines led to the *paltrok* mill, the name of which we might translate as the 'ratchet-feed' mill, (photo page 31). This is surely the finest example of all of the fine craftsmanship possessed by these old millwrights. Most of them contained eight vertical saws, set in saw-frames. After each cut, the logs were hauled forward into position for the next cut, on a trolley. This method, revolutionary in those days, brought with it unheard-of savings in time and costs, and the timber trade reached new heights of prosperity. Most of the rough lumber on which it was based was imported from the Baltic countries.

In 1582, the first oil mill was built at Alkmaar, now famous for its cheese market. Oil was expressed from certain kinds of oleiferous seed by means of heavy stampers, and the industry has always been able to keep its head above water.



A Zaan valley mill, in the celebration position with marriage attire

Husking mills are used purely for the husking of grain, originally only barley, but later on rice from the East Indies as well. The earliest of these mills was one erected in 1660 at Koog-aan-de-Zaan. The mechanism of the mill consists of propelling the grain against the inner surface of a perforated drum, in a rapid spiral motion. The sharp edges of the perforations peel the husks off the grains.

Paper mills have played an important industrial rôle too. In very early days they only made the more impure grades of grey and blue paper. The fine 'Old-Hollands' hand-made white paper was known in those days, but it was made in the water-mills of the more easterly district known as the Veluwe, by papermakers who had immigrated from France. These refugees were forced to flee for a second time in 1673 and quite a lot of them ended up in the Zaan District, where they took to making their beautiful grades of white paper by windmill. Their raw material was rags, and the product of such fine quality that it became much in demand abroad, particularly as a letter-press printing paper.

Snuff mills, as their name suggests, were engaged in grinding snuff from tobacco. Readers will be interested to learn that there are still two of them in action near Rotterdam, whose main customers are the monasteries in France! Fulling mills were known as well, their work consisting of 'fulling' cloth — a business carried on in earlier days by stamping with the feet, or by horse mill. Closely connected with shipping were the hemp-twisting mills, making ropes for the vessels that fed the Zaan with raw materials. Liquor mills served to grind oak-bark into tan, for making the liquor used in tanning leather.

Out of all this variety, virtually only the sawmills and the husking mills are still in action now.

Industrial mills had to stand out above the encircling buildings to benefit to the full from the fresh breeze, and the number of storeys in the tower tended to increase with the years. The space available for the firm managing the mill increased with it, but the size of the sails remained more or less the same. The 'winding' of the mill sooner or later necessitated the addition of a gallery or balcony somewhere about half the height of the tower, (photo page 33), and galleries are in fact to be seen now on nearly all really high corn windmills.

Anyone who ever has the opportunity of visiting a corn windmill, should grasp it with both hands. Every miller is an enthusiast for his work, and will show tourist after tourist over his mill with eternal patience and cheerfulness. It is only after taking a really close look at the wonderful workmanship of the mechanism, and savouring the unique sphere of the interior of a mill, that one can say with conviction, with the English poet — "I lean upon the paddock pale, and gaze upon the giddy mill, ...". Here it all is, in actual fact, and no-one should miss experiencing it at least once in a lifetime.

A LIVING TRADITION

In the Netherlands, there lives on a deep interest in the tradition that is the heritage from an illustrious past, though this is not always obvious. By the late middle ages, the miller had already become an important figure in the local community. The remarkable thing is, that he seems not to have been always accepted as an exemplary character. In one of Geoffrey Chaucer's stanzas from the Canterbury Tales, it is asserted that "Every miller has a golden thumb", to which is replied "True, but it takes a thief to see it".

The Dutch language includes a wealth of proverbs and expressions drawn from the miller's craft. For instance — "He's been hit by a mill-sail" meaning "He is'nt quite all there"; "That's corn for his mill"; analogous to the English "That's grist to his mill; and a variation of "First come, first served", in "He who comes first, grinds first"; and there are many more of them. Quite naturally, the millers have their own jargon, just as so many other callings, particularly sailors.

In former days, a good deal of attention was paid to decorating the windmill. Facing bricks of particularly fine colour were often used in the tower, and almost all mills boasted a fine carved wooden 'beard', (photo page 40), — a plank set just below the opening for the 'windshaft' behind the sails. The roofs of *wipmolens* were often decorated with carvings known as *makelaars* and the 'facade' of the mill cap usually terminated in an 'acorn' motif at the lower end.

The colours too, are generally traditional. The 'poll end' of the windshaft is always decorated with a star motif, often in

gold or red, or in blue and white. The timber work of polder mills is usually green, combined with white or some other light colour for the framework. Black is often to be met with where the windmill is tarred, and in the environs of Leyden, a good many *wipmolens* are painted reddish-brown.

The 'winding wheel' is also normally decorated with a star, the traditional colours here being green and white. For centuries now, millers have known and used a 'sail code' by means of which quite a lot of information can be passed from mill to mill. Celebration and mourning are the sentiments most commonly expressed in this way, though the miller can also indicate that he is prepared to accept more work (corn windmills) or that he protests against fouling of the water (polder mills).

When one pair of sails is vertical and the other horizontal, the sails are said to be set in the 'working position', and indicate that the mill is ready to commence work at any desired moment.

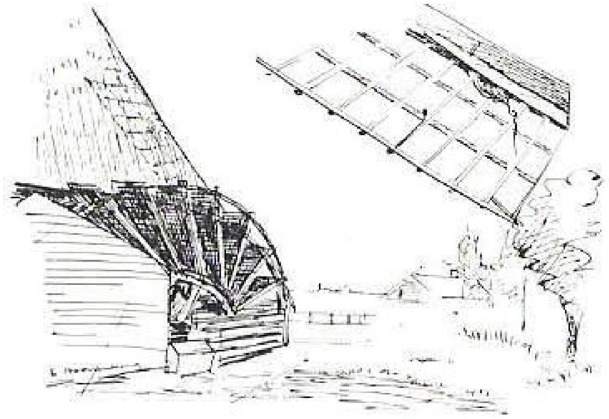
When the sails are set an angle of 45 ° to the horizontal — or vertical of course — it is indicated that the windmill is to remain unused for some considerable time. When the sails of a polder mill are set like this, it is known as the 'protest position'; the mill can work, but the water flow is restricted by surplus vegetation in the drainage channels.

If the miller sets his sails just slightly before the vertical and horizontal, he is conveying the message to all and sundry that there is celebration in his mill — either a son has been born to him, or there is some other joyful occasion.

With the sails turned just past the 'working position', the mill reaches the 'mourning position' — some-one in the family has passed away. The mill will probably stay quite a long time in this position. Of course, work goes on as normal; only when it is shut down does the mill go into mourning. The miller also stops his mill and sets it in this position when a funeral procession passes, and follows the procession through to the churchyard by turning the mill or cap to face it.

These are the main positions — there are more, of course, and quite a lot of them vary from district to district. When a really important celebration comes around, the sails are brought into the 'celebration position' — just as for any other pleasant occasion — and flags are flown from them and from the cap, and all manner of traditional ornaments are hung on the sails — cages, baskets, hearts, tin discs, etc. The effect, seen from some distance, is quite out of this world. Two instances of these special decorative schemes are the 'Whitsun attire' and the 'Marriage attire', (photo page 35). For this latter occasion, the sails are set at 45°, and rolled-up sail cloths are threaded in and out of the slats. Lines are slung between the upper and lower sails, and on them, garlands, images of the sun, the 'bride's cage', the 'bridegroom's cage', Cupid's arrows, and similar finery are hung. At the very topmost point flies the red, white and blue flag of the Netherlands, and a little lower are the trumpeting angels, sounding in a lifetime of happiness for the bride and groom — a truly grand spectacle, and proof of a living tradition, which the Netherlands people hope will live on many more years yet.

Tourist information can be obtained from the Netherlands National Tourist Office (A.N.V.V.), 38 Parkstraat, The Hague, from its branch offices in Brussels, Paris, London and New York and its agencies in most of the other important cities of the world. In Holland offices of the Tourist Development Associations (V.V.V.) are to be found in every town or village of importance. Advice will gladly be furnished on points of interest, museums, theatres, concerts, amusements, etc.



PRINTED IN THE NETHERLANDS
BY THE NETHERLANDS GOVERNMENT PRINTING OFFICE
7311 - '50